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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/851,905	05/09/2001	Thomas Sonderman	2000.044700	3951

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EXAMINER

JARRETT, RYAN A

ART UNIT	PAPER NUMBER
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2125

DATE MAILED: 06/12/2003

5

Please find below and/or attached an Office communication concerning this application or proceeding.

13

Office Action Summary

Application No.

09/851,905

Applicant(s)

SONDERMAN ET AL.

Examiner

Ryan A. Jarrett

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 May 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-60 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-60 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 5/1/03 have been fully considered but they are not persuasive. In reference to these arguments, Applicant states that **Turner** does not determine a deposition rate, but then admits that **Turner** calculates a percentage of a normalized deposition rate. Thus, it is the Examiner's view that **Turner's** calculation (as shown in Fig. 3) reads on claim 1. Yes, it is true **Turner** does not use deposition rate sensors to determine the deposition rate, but deposition rate sensors are not claimed in the Applicant's invention.

Applicant then states that **Turner** "does not disclose modeling the deposition rate at all" and incorrectly states that the Examiner used Figure 1 as an example of an implicit teaching of modeling plasma power. The Examiner did not use Figure 1 for this purpose. Instead, col. 3 lines 23-32 of **Turner** was referenced as a **clear** example of modeling a dependence of the deposition rate on the deposition plasma power. The function **is** the model. Figure 1 is also a clear example of modeling a dependence of the deposition rate on sputter target life. As disclosed in col. 3 line 30, τ is the integrated "age", or life, of the cathode (sputter target) in kilowatt-hours.

The Examiner's implicit argument was actually used to reject claims 9 and 10 (and the other similar claims) with regard to modeling the dependence of the deposition rate and the plasma power **using the various curve fitting techniques**. This argument was based on the fact that **Turner** discloses modeling a dependence of deposition rate and power, but not explicitly using curve-fitting techniques. However,

Turner does disclose in Fig. 1 modeling deposition rate and target life using curve-fitting techniques. Thus, one could imply that **Turner** models deposition rate and power using the same techniques. This feature of the claimed invention can similarly be rejected under 35 U.S.C. 103. Thus, an additional rejection under 35 U.S.C. 103 has been presented below.

Finally, Applicant states that **Sullivan** does not disclose modeling a dependence of deposition rate on deposition time. However, Figure 5 is a clear example of this modeling. And it's clear from col. 7 line 50 – col. 8 line 10 that the model can be “inverted” to determine the deposition time required to reach a deposition rate and a desired thickness.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-30 and 41-60 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant has amended independent claims 1, 11, 21, 41, and 51 to include the limitation “based upon a target life of the sputter target”. However, it is not clear **what** is based on this sputter target life. Dependent claims 2, 12, 22, and 42 already recite “modeling a dependence of the deposition rate on a target life of the sputter target”, so it is not clear how these sets of claims differ.

Claims 2-10, 12-20, 22-30, 42-50, and 52-60 depend from claims 1, 11, 21, 41, and 51 and thus incorporate the same deficiencies.

Claim R ejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

5. Claims 1, 2, 5, 6, 9-12, 15, 16, 19-22, 25, 26, 29-32, 35, 36, 39-42, 45, 46, 49-52, 55, 56, 59, and 60 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Turner U.S. Patent No. 4,166,783. Turner discloses a method, program storage device, computer, and system comprising: monitoring consumption of a sputter target to determine a deposition rate of a metal layer during metal deposition processing using the sputter target (col. 3 line 64 – col. 4 line 7); modeling a dependence of the deposition rate on the deposition plasma power (col. 3 lines 23-32); and applying the deposition rate model to modify the metal deposition processing to form the metal layer to have or approach a desired thickness (col. 3 lines 12-16, col. 3 lines 32-36);

wherein monitoring the consumption of the sputter target to determine the deposition rate of the metal layer during the metal deposition processing comprises modeling a dependence of the deposition rate on a target life of the sputter target (col. 3 lines 23-32);

wherein applying the deposition rate model to modify the metal deposition processing comprises inverting the deposition rate model to determine the deposition plasma power to form the metal layer to have the desired thickness (col. 3 lines 32-36);

wherein modeling the dependence of the deposition rate on the deposition plasma power (implied) and target life (Fig. 1) of the sputter target comprises fitting previously collected metal deposition processing data using at least one of polynomial

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curve fitting, polynomial least-squares fitting, non-polynomial least-squares fitting, weighted least-squares fitting, weighted polynomial least-squares fitting, and weighted non-polynomial least-squares fitting (Fig. 1 illustrates the modeling of the sputter target life least-squares fitting – it is implied that the plasma power is modeled in a similar fashion);

wherein modeling the dependence of the deposition rate on the target life of the sputter target comprises modeling the dependence of the deposition rate on target lives of a plurality of previously processed sputter targets (col. 2 lines 10-13).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 3, 4, 7, 8, 13, 14, 17, 18, 23, 24, 27, 28, 33, 34, 37, 38, 43, 44, 47, 48, 53, 54, 57, 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Turner in view of Sullivan et al. U.S. Patent No. 6,217,720. Turner does not specifically disclose “modeling a dependence of the deposition rate on the deposition time or inverting the deposition rate model to determine the deposition time to form the metal layer having a desired thickness.” However, Sullivan et al. discloses a multi-layer reactive sputtering method comprising modeling the dependence of a deposition rate on a deposition time and determining the time required to form a metal layer having the desired thickness (e.g. Fig. 5, col. 7 line 50 – col. 8 line 10, col. 8 line 60 – col. 9 line 15). Therefore, it

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would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the teachings of Sullivan et al. with the system of Turner since Sullivan et al. teaches that modeling a dependence of a sputtering deposition rate on the deposition time can assist in optimizing a desired layer thickness using a relatively high deposition rate.

8. Claims 9, 10, 19, 20, 29, 30, 39, 40, 49, 50, 59, and 60 are *additionally* rejected under 35 U.S.C. 103(a) as being unpatentable over **Turner** as applied to claims 1, 2, 11, 12, 21, 22, 31, 32, 41, 42, 51, and 52 above, and further in view of Official Notice. **Turner** does not explicitly disclose that the deposition rate and power are modeled using the curve-fitting techniques of the claimed invention. However, **Turner** does disclose in Fig. 1 modeling deposition rate and target life using curve-fitting techniques. Additionally, all of the various curve-fitting techniques of the claimed invention are well known in the art. Therefore, it would have been obvious to modify **Turner** to include the capability to model deposition rate and power using the various curve-fitting techniques since **Turner** already discloses curve-fitting as a means to *accurately* model deposition rate and target life, and also since the multiple curve-fitting techniques of the claimed invention are well-known in the art.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Jun U.S. Patent No. 6,178,390 discloses a method for controlling thickness of layers formed by deposition equipment for fabricating semiconductor devices.

Cheung et al. discloses a method and apparatus for applying films using reduced deposition rates.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ryan A. Jarrett whose telephone number is (703) 308-4739. The examiner can normally be reached on 9:30-6:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard can be reached on (703) 308-0538. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-7239 for regular communications and (703) 746-7238 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.



raj
June 5, 2003

LEO PICARD
SUPERVISORY PATENT EXAMINER
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